New Results from CIRM-funded Researchers

Control of stem cell fate

Protein found to direct embryonic stem cells as they mature

CIRM-funded author: Roel Nusse

Researchers at the Stanford University School of Medicine have found that clusters of embryonic stem cells in a lab dish share some unexpected similarities with actual embryos. These clumps, called embryoid bodies, consist of hundreds of cells, many of which begin to form more mature cell types. For example, they often contain groups of primitive heart muscle cells that beat visibly. In this work, which was published in the November 6, 2008 issue of *Cell Stem Cell*, the researchers found that the embryoid bodies also contain a line of cells that resemble an embryonic structure called the primitive streak. This streak is the first indication that the embryo has a top and bottom or back and front. Blocking molecules found in the embryoid body primitive streak pushed those cells to form a group of cells that make up skin and nerves. Enhancing those molecules pushed the cells to form cell types like muscle and intestine. This work could help researchers learn how to push embryonic stem cells to form particular cell types, which is a necessary step in developing stem cell-based therapies.

Related Information: Cell Stem Cell paper, Press release, Stanford Stem Cell Biology and Regenerative Medicine Institute, Funding grant summary, Nusse lab page

Heart disease

Embryonic stem cells repair heart damage in mice

CIRM-funded authors: Joseph Wu, Micha Drukker, Irving Weissman, Robert Robbins

Researchers at the Stanford University School of Medicine found that cells derived from human embryonic stem cells could repair damage in a mouse model of heart attack. The researchers first looked at which genes were active at every stage between the human embryonic stem cells and early heart muscle cells. The cells they implanted mirrored the genes that are active in the hearts of 20 week old fetal mice. After injecting the cells into the heart of a mouse with an induced heart attack, they found that the cells incorporated into the heart and significantly improved the heart's ability to pump blood. This work, which appeared in the October 22, 2008 issue of *PLoS ONE*, could lead to new stem cell-based therapies for repairing damaged heart tissue

Related Information: PLoS ONE paper, Stanford Stem Cell Biology and Regenerative Medicine Institute, Funding grant summary, Wu bio

Heart disease

Genetic Factor Enables Immature Cells to Form Normal Heart Tissue

CIRM author: Deepak Srivastava

Researchers at the Gladstone Institute for Cardiovascular Disease found a genetic factor that helps in the earliest stages of heart development as the primitive tube loops around on itself and forms the separate chambers. This factor -- a short relative of DNA called microRNA -- has an identical counterpart in humans, leading the researchers to believe that their work in fish is likely to relate directly to human heart development. When the researchers interfered with this microRNA while the heart was developing, the immature heart muscle cells failed to mature and the heart chambers didn't form normally. These heart muscle precursors are a stage in between the embryonic stem cell and the mature heart muscle cell. The heart is among the first organs to develop and also the most critical. When the heart doesn't develop properly the embryo dies. What's more, common birth defects involve abnormalities in how these chambers form. Understanding all the steps between an embryonic stem cell and the mature heart cell could help researchers prevent or treat birth defects of the heart. The work was published in the October 27, 2008 issue of the *Proceedings of the National Academy of Sciences*.

Related Information: Press release, Gladstone Institute of Cardiovascular Disease, Funding grant summary, Srivastava bio

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